

Chapter 3: Recommended sizing procedures

Meridian IVR software

Base software packages

The following software is provisioned according to how many channels are requisitioned:

- Development Base Package (4 channels)
- Development Expansion Packages (in 4-channel increments) (optional)

The Development Base Package gives the Meridian IVR system a 4-channel capacity. If additional channels are required, capacity can be added by purchasing additional channels. This method increases system capacity in 4-channel increments.

Note: This is valid only for non-card option systems. For a card option Meridian Mail system the minimum channel configuration is 2 and it can be incremented in units of two.

Host communication software

Host connectivity is supported in Release 2.0/I via the “COMI”, “COMO”, and “COMA” Cells (Host Communication Input, Output, and Abort) for Meridian IVR Release 2.0/I. This provides high-level support for the IBM /3270 SNA/5250 and VT100 interfaces. By emulating an operator providing input and/or retrieving output from a 3270/5250 or VT100 sessions, the Meridian IVR application can easily access required information that is normally displayed on the terminal screen.

The following templates are needed:

- Screen templates that define the location of input and output fields on the terminal screen. This is accomplished either via row and column offset or via a unique field identifier that serves as a tag to identify the field.
- Action templates that connect the screen templates into a logical transaction that must be traversed in order to accomplish the desired action. This emulates actions such as a terminal operator entering an account number on the first screen, completing the input by then pressing a function key, and finally obtaining a screen output that contains the desired account balance.

Host card

The hardware used to support IBM mainframe connectivity is the EXPRESS high performance adapter (SYNC570) card. The SNA/3270 communications software, integrated with the host communication cells provides connectivity to an IBM mainframe by emulating an IBM 3274 cluster controller with 3278/3279 terminals. Through customer defined user functions, application developers can integrate additional communications software available from Apertus.

This includes:

Host connectivity through cells:

- IBM SNA/3270 (including 3274, 3278, 3279)
- SDLC and over Token Ring
- VT100 emulation over serial ports
- 5250 over token ring (LLC) and SDLC

Host Connectivity through a user functions (not provided as part of the product)

- Native or LAN Token Ring and Ethernet
- IBM 3270 over X.25 (European requirement, QLLC)
- Standard RS232 serial interface

5250 host connectivity

For Meridian IVR Release 2.0/I, in addition to 3270 emulation, the new host communication cells will also provide the same level of interface for 5250 terminal emulation over Token Ring (LLC) or through Expresscard (SDLC).

Other host connectivity

Access to hosts using ASCII async (RS232/422), X.25, and Ethernet data communications protocols will be facilitated via the use of the User Function cell. It will require that the code to support these forms of connectivity be written by the application developer in the C programming language.

For Meridian IVR Release 2.0/I, in addition to 3270 emulation, the new “COMI”, “COMO” and “COMA” host interface cells will also provide the same level of interface for VT100 terminal emulation via RS-232.

To meet international standards, the template files use translation tables for character conversion to map to host computers using local variants of 7-bit ASCII. Translation tables are provided with the SNA/3270 communications software for each language for which character conversion is required.

Meridian IVR Fax Response software

Meridian IVR Fax Response is an option for Meridian IVR Release 2.0/I which provides send and receive fax capability through the telephone by means of DTMF and audio.

Meridian IVR Fax Response uses the graphic user interface (GUI) on the Meridian IVR palette to include fax functions (that is, to receive a fax, send a fax, and so on).

In addition, Meridian IVR Fax Response closely integrates with the data base and host computer functionalities on the Meridian IVR. This allows fax data to be easily derived from these sources.

Meridian IVR Fax Response uses Meridian Mail as its voice processing platform.

Meridian IVR Fax response incorporates, in addition to all Meridian IVR components, internal fax modems and Meridian IVR Fax Response software.

SQL database support

Structured Query Language (SQL), is a popular user interface for interactive database sessions. SQL database support will be an optional feature which will only be installed if purchased by the customer. Meridian IVR support of SQL makes possible the creation of IVR applications that can interface with these databases.

The SQL interface into the database provides SELECT, INSERT, UPDATE, DELETE, and COUNT capabilities (interface cells).

Eight SQL database configurations will be supported in Meridian IVR Release 2.0/I:

- Local and Remote Informix
- Local and Remote Ingres
- Local and Remote Oracle
- Local and Remote Sybase

For a SQL database access, the optional SQL package must be ordered and the database software required to install and run the local or remote SQL database must be purchased by the customer directly from the corresponding database vendor.

Traffic principles

Terminology

Centi-call seconds

This chapter uses the value of centi-call seconds (ccs) to express traffic, traffic is calculated as follows:

Traffic (in ccs) is expressed as the busy hour call volume multiplied by the average call length in seconds divided by 100.

Grade of service

Grade of service is expressed as GOS.

Meridian IVR traffic model

The traffic model which you design to use with an IVR system depends on how the Meridian switch treats incoming calls.

The IVR system provides a finite number of channels on which calls can be processed. If all the channels are busy, the switch can either block incoming calls destined for the IVR system, or it can queue up these calls.

Queueing The queueing model is used by all Meridian IVR systems fronted by a Meridian 1 PBX.

Blocking systems fronted by a DMS will block calls when used in conjunction with UCD queues, and the Multi-Line Hunt Group. A Meridian 1 PBX can also block calls by equating the number of incoming IVR trunks to the number of IVR channels.

Target Grade of Service

The target Grade of Service (GOS) is a means of simply determining when a caller is queued beyond a certain amount of time, or when a caller is blocked. A number of factors affect the Grade of Service

- 1 the call volume (for example, the number of calls in a busy hour)
- 2 the average length of the calls
- 3 the number of channels available to service these calls
- 4 whether the channels are dedicated or shared

Factors 1 and 2 together make up the traffic intensity. For example, if an application expects 100 calls in the busy hour and each call lasts an average of 2 minutes, then the traffic intensity on that application is 100×120 seconds, which is 12 000 call seconds or 120 centi-call seconds (120 ccs).

The GOS is dependent on the call hold time which makes it indirectly dependent on the response time characteristics of the application. An application with bottlenecks (for example, a slow external host) will lead to higher call hold times and, hence, a deteriorated Grade of Service.

There is a one-to-one correspondence between the number of Meridian Mail channels which may be used for Meridian IVR and the number of Meridian IVR channels. Therefore, a 96-channel Meridian IVR system must have exactly 96 Mail channels used for IVR in shared or dedicated mode. If IVR channels are shared with Meridian Mail services, the traffic generated by the mail services affects the GOS for Meridian IVR.

GOS for queueing traffic model In a queueing traffic model, the recommended GOS is a five percent probability that the delay in the queue will exceed one ring cycle. This is known as a P.05 GOS. One ring cycle is approximately six seconds.

GOS for blocking traffic model In a blocking traffic model, the recommended GOS is a two percent probability that a caller will be blocked. This is a P.02 GOS.

Target response time dependencies

While the GOS is not directly dependent on MIVR CPU power, the response time is. In addition, if external factors like 3270 hosts are present, the response time becomes dependent on their response characteristics as well.

One response time which is always dependent on Meridian IVR is the time between when a caller finishes entering DTMF input and when the system responds by playing a prompt. This time should be less than two seconds 95 percent of the time and should average under 1 second. This target should be met even if the response time includes local data retrieval.

Fax response traffic model

The Fax response traffic model has both queuing and blocking capabilities. A pure queuing model is used for Callback fax. The application initiates a callback request. The fax is queued up and sent out once it reaches the top of the queue and a fax modem becomes free.

The Same Call model is more complex. An application wishing to use Same Call fax first has to reserve a modem. It is recommended that the modem be reserved as close as possible to the time when it is to be used. If a reserved modem remains idle for more than five minutes, it is freed up by the system. The application can also specify a time that it is willing to wait to reserve a modem. The Same Call model thus becomes

- the blocking model if that time is set to zero
- the queuing with a time-out model if the time is nonzero
- the application dequeues if the time in queue reaches a threshold.

Modems can also be shared between Same Call and Callback usage if all the modems in either set are busy.

Target Fax Grade of Service

The factors affecting the fax GOS are

- 1 the number of faxes requested in a busy hour
- 2 the average number of pages and their resolution
- 3 average rendering time per page
- 4 the number of fax ports available

Fax rendering and sending are one operation to an IVR application. Therefore, factors 2 and 3 determine for how long a fax port is held. Together with factor 1, they determine the fax traffic intensity.

The Fax GOS is important in a Same Call situation because the fax operation will take place on the same IVR call. The GOS is the probability that a fax modem does not become available in a certain time (which could be 0).

The target GOS for Callback fax is a measure of the probability that a fax sitting in the queue waiting to go out exceeds a certain time limit. This is important when an IVR application promises to send a fax within a certain time.

Another factor which may affect Callback fax is the probability that the remote machine is busy. If the fax is being sent with a retry option, it will be queued up again. For the purposes of this document, this factor is ignored.

Fax on demand (Callback delivery)

The Fax Application traffic must be estimated and channel requirements determined for the number of faxes requested in the busy hour. This is done by

- estimating the average session length for each defined fax application
- estimating the expected maximum number of busy hour calls to that application

The traffic from a “Callback” fax delivery should include the duration of the call to receive the request, and also the duration of the call that delivers the faxes. The call receiving the request consists of the following components

- time to listen to voice menus (15 seconds)
- time to select options (10 seconds for each option selected)
- time to enter callback number and extension (30 seconds)

The session time for each fax delivery can be estimated as follows

- a 10-second time to set up the call
- a 14-second time to answer call
- a 12-second time to establish protocol
- 40 seconds per page in normal resolution and 80 seconds per page in fine resolution
- a 10-second time to complete fax delivery

This assumes that the fax will be delivered on the first attempt. Additional time should be added if this is not the normal case.

When the application is running, the fax delivery report can be periodically monitored to see if the actual wait times are within the desired limits.

Fax on demand (Same Call delivery)

The Voice Menu traffic must be estimated and channel requirements determined for the number of faxes requested in the busy hour. This is done by estimating the average session length for each menu defined, the number of pages in the fax to be delivered, and the expected maximum number of busy hour calls to that menu.

The traffic from a Same Call fax delivery call should include the following components:

- time to listen to greeting prompt
- time listen to voice menus and select as many faxes as required
- time to receive 'Same Call' faxing instructions
- time to transmit the faxes selected
 - a 12-second time to establish protocol
 - 40 seconds per page in normal resolution and 80 seconds per page in fine resolution
 - a 10-second time to complete fax delivery

Tables have been generated for fax session lengths of 234 seconds (3.9 minutes). The tables indicate the traffic which can be handled by a given number of multimedia channels. Refer to the Fax GOS tables in **Appendix G: "Erlang tables" on page G-1** for more information.

Note: An analysis was done for fax session length and number of pages in each fax at the TOR site (for MM9). The average session length was 234 seconds and the average number of pages in each fax was 4.8. These figures were considered a useful starting point for the fax traffic tables used in this document.

Fax storage limit

Since all fax data is stored under a single directory hierarchy, standard UNIX utilities (du) can be used to determine when fax storage has been exceeded. The system will not receive any more faxes when the file system threshold is exceeded.

Hard disk storage

At 60 Kbytes per Fax page, approximately 30 Mbyte of disk space is needed for 500 pages of Fax data.

Second hard disk

The second Hard drive is used when a large area for Fax storage is required, or Database software and other data has occupied a large amount of hard disk space so there is not enough space for the Fax data. The size of the second hard disk is 1012 Mbytes in total. When the Meridian IVR system has been installed there is 10.31 Mbytes free disk space remaining.

Notes:

- 1** The second hard disk is used *only* for storing the Fax data.
- 2** There is only one partition on second hard disk (sdisk).

Storage calculations

There are two primary components of capacity for every Meridian Mail system: channels and hours of storage. The size of the system, in channels and hours, determines the number of users who can use the system, and the level of service that Meridian Mail/IVR provides.

Channels

The number of channels on a system determines the number of users who can access IVR at one time. For example, a 12-channel system allows twelve users to use IVR at any one time.

Hours of storage

All the voice prompts (system as well as prompts and voice messages recorded by Meridian IVR) are stored in Meridian Mail mailboxes. Individual mailboxes can contain a maximum of six hours of voice storage. Hours of storage must be determined as the accumulated storage requirements of the total number of mailboxes used by the Meridian IVR system.

Types of channels

Meridian Mail channels for Meridian IVR can be configured as dedicated or shared channels. If dedicated, the channels are used for Meridian IVR only, while shared channels are used for Meridian Mail or Meridian IVR as determined by the incoming call.

The channels dedicated to Meridian IVR can be common to all Meridian IVR applications or can be dedicated to specific Meridian IVR applications only. This allocation of channels has a direct impact on the number of channels that have to be provisioned.

By dedicating channels, you can control the Grade of Service and caller access, but channel use will be less efficient. In this document, three grades of service are discussed: two percent delay, five percent delay, and a recommended grade. Two and five percent refer to the percentage of callers that will experience a delay, that is, to wait in a queue before their call is answered. When a delay is experienced the average is about a 10-second delay. The average delay of all callers will be well under one second.

At the recommended Grade of Service, the average delay of callers experiencing a delay will be about 10 seconds, and the average delay for all callers will be under two seconds. Such delays would be expected during the busy hours. At other hours with less traffic, delays will be less frequent.

Estimating the number of channels

Channel requirements are determined using standard traffic engineering principles that take into account busy hour traffic and the desired Grade of Service. The busy hour is the highest traffic hour for a customer. For Meridian Mail/Meridian IVR, traffic capacity is stated in ccs, hundreds of seconds of connect time per hour. Refer to **“Traffic principles” on page 3-4** in this chapter for more information about determining traffic capacity for your Meridian IVR system.

Determining requirements

You must analyze the customer’s specific applications before you can determine the channel requirements for Meridian IVR. Meridian IVR channel requirements can vary widely in terms of the number of calls requiring processing and the holding times of those calls.

To ensure that Meridian Mail provides adequate capacity, follow these steps for each Meridian IVR application:

- 1 Estimate the average length of a call in seconds. An average holding time for a short IVR application may be 60 seconds, while a lengthy IVR application may be 300 seconds.
- 2 Estimate the number of calls per busy hour.
- 3 Estimate the total traffic load for Meridian IVR in ccs by multiplying the step 1 estimate by the step 2 estimate and dividing by 100. Do this for each planned application.

- 4 Decide whether channels for these applications will be shared or dedicated between Meridian Mail and Meridian IVR. If Meridian IVR will share channels with Meridian Mail voice messaging, you only need to add this traffic to Meridian Mail voice messaging requirements. By dedicating channels, you can control the Grade of Service and caller access, but channel use is less efficient. If the application will have channels dedicated to it, you need to designate channels per service configuration.
- 5 To determine the fewest number of channels required to accommodate the total activity for the system, use the number from step 3 and refer to **Table G-1 "Grade of service and traffic formula"** on page G-1 to find the number that best accommodates the total activity calculated above given the Grade of Service required.

Note: Outbound applications (those which make calls) require dedicated channels.

- 6 For each group of applications that share common channels, sum the traffic loads from step 3.
- 7 To determine the fewest number of channels required to accommodate each group of applications, use the numbers from Step 5 to find the number of channels that best accommodates the total activity calculated above given the Grade of Service required.
- 8 The total of the numbers from step 6 gives the number of channels that are required to accommodate the total activity for the system.

Note: Meridian IVR supports a maximum of 48 channels and up to 24 shared (dynamically allocated) channels. See **Table 3-7, ACCESS link capacity limits**, on page 3-21.

Example of multiple application requirements

A customer has three Meridian IVR applications. The main IVR application answers all calls to the company, and will invoke the other two IVR applications, IVR2 and IVR3 if necessary. All three applications use the same dedicated Meridian IVR channels. The average delay for callers must not exceed one second, and no more than five percent of the callers should encounter a delay in the busy hour (this equates to a five percent delay Grade of Service).

Table 3-1
Example table for GOS P.05

Procedure	Step 1	X Step 2	= Step 3
Application	Calls in Busy Hour	X Holding Time (seconds)	Total Time (seconds)
Main IVR	200	X 20	4000 seconds
IVR2	20	X 240	2400 seconds
IVR3	30	X 180	5400 seconds
Total Time			32000 seconds or 118 ccs

Total system activity for all IVR applications is 106 ccs. Refer to [Table 3-1](#) for 106 ccs and the recommended Grade of Service. Total port requirements are 8 ports for IVR.

Example of multiple fax application requirements

The customer has four IVR applications, the main IVR application (IVR_MAIN) answers all calls to the company and walks the caller through the fax menu.

The customer has three other IVR fax applications: IVR_Fax_1, IVR_Fax_2 and IVR_Fax_3.

The typical session duration for the IVR_MAIN menu is 45 seconds (time to listen to the voice menu, plus time to select an option, plus time to enter the callback number if required):

- IVR_Fax_1 is 214 seconds (4.8 pages of fax in standard resolution)
- IVR_Fax_2 is 480 seconds (6 pages in fine resolution)
- IVR_Fax_3 is 382 seconds (3 pages)

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For simplicity assume that IVR_Fax_1 and IVR_Fax2 will use Callback channels, and IVR_Fax_3 will use Same Call channels.

Table 3-2
IVR_Fax_1 holding time values

Measurable actions	Time (in seconds)
listen to fax menu	25
time to set up call	10
time to answer call	14
time to establish protocol	12
time to complete fax delivery	10
Add (for 4.8 pages, standard format):	$(4.8 * 40)$
Holding time:	263 seconds

Table 3-3
IVR_Fax_2 holding time values

Measurable actions	Time (in seconds)
listen to fax menu	25
time to set up call	10
time to answer call	14
time to establish protocol	12
time to complete fax delivery	10
Add (for 3 pages, fine format):	$(3 * 80)$
Holding time:	311 seconds

Table 3-4
IVR_Fax_3 holding time values

Measurable actions	Time (in seconds)
listen to fax menu	55
time to establish protocol	12
time to complete fax delivery	10
Add (for 3 pages, standard format):	(3 * 40)
Holding time:	197 seconds

Table 3-5
Example table for GOS P.05 and P.02

Procedure	Step 1	Multiply	Step 2	= Step 3
Application	Calls in Busy Hour	X	Holding Time (seconds)	Total Time (seconds)
IVR_MAIN	30			
IVR_Fax_1 (Callback)	10	X	(25+10+14+12+10+(4.8 * 40))	2630
IVR_Fax_2 (Callback)	10	X	(25+10+14+12+10+(3 * 80))	3110
IVR_Fax_3 (Same Call)	10	X	(55+12+10+(3 * 40))	1970
Total Time for P.05 (Callback)				5,740 (57 ccs)
Total Time for P.02 (Same Call)				1970 (20 ccs)

Total system activity for all Callback IVR Fax applications is 57 ccs and 20 ccs for Same Call Fax applications. Refer to the Fax GOS tables in “Appendix G: Erlang tables” on page G-1 for 57 ccs and 20 ccs the recommended Grade of Service.

Total port requirements for Callback ports are five ports and three ports for Same Call Fax.

In some cases, when it is determined that the use of Callback channels is high in certain hours and may exceed the limit where use of Same Call channels is low, it is a good idea to turn some of the Same Call channels into Shared channels or vice versa.

Ongoing channel sizing

After the Meridian Mail system is installed, the system administrator uses Operational Measurements reports to provide statistics on system traffic and activity. By monitoring these reports, the administrator can keep track of system capacity and forecast when, and if, an increase in the number of channels is required.

Note: If dedicated channels are used, Meridian IVR acquires the channels permanently when the application is started, and Meridian Mail Operational Measurements reports the channels as active from the time the Meridian IVR application is running. Therefore, the Meridian IVR Call Detail report should be used to determine actual ccs for applications using dedicated channels. Alternatively, Meridian MAX reports provide a view of actual call traffic on Meridian Mail channels.

Table 3-6
Port addition increment for Fax and IVR

	Minimum # of IVR Ports	Addition of channels by increment of	Maximum # of channels
8-Mbyte Card Option	2	2	12
Other supported MMail platforms	4	4	96
Fax option	2	1	8

Control of maximum number of channels

Meridian IVR controls the utilization of Meridian IVR channels purchased by customers. Keycodes are used to restrict the customer from using more than the number of channels purchased.

The maximum number of fax ports available to the customer are also limited if the Fax Response option is purchased.

Deciding between dedicated and shared channels

Meridian Mail channels can be dedicated to Meridian IVR, or they can be shared with other Meridian Mail services like call answering. Consider the following points when deciding between shared and dedicated channels:

- 1 The traffic intensities of the IVR applications and Meridian Mail should first be considered separately.

If one intensity is low compared to another, it may be better to dedicate the appropriate numbers of channels separately. A guideline is if one is a tenth of the other. For example, if IVR traffic is going to be 6 ccs and mail traffic 60 ccs, size each service separately and dedicate the channels separately.

If both are roughly equal, it may be better to share channels so that, if unexpected peaks occur, there is a bigger pool of channels to draw upon depending on the busy hours.

- 2 The traffic patterns of the two services should be considered when sharing channels. If the busy hours coincide, then the traffic intensities should be added up to give total traffic, and this figure would be used to determine the number of channels.

If the busy hours are separated, then the busy hour with greatest traffic intensity should be used in determining the number of channels (for example, if both IVR and call answering have busy hour traffic of 60 ccs each, but IVR busy hours are in the morning and call answering busy hours in the afternoon). There is also a constant call answering load of 10 ccs in the morning and 5 ccs of IVR in the afternoon.

In this example, the morning busy hour load is 70 ccs and the afternoon load is 65 ccs. Thus, 70 ccs would be used in sizing the system.

- 3 There may be a case where the decision is made in the context of the service being offered. In the case of a service provider, the provider may be selling channels to customers. Here, obviously, the channels would be dedicated and sized by the intensity and GOS which the customer wants.

Shared channels put a slight overhead on Meridian Mail. The advantage is that there is a bigger pool of channels to draw upon for unexpected peaks. Also, there is a limit of 24 channels per ACCESS link, (running at 9600 baud) which can be shared with Meridian Mail services. For more information see [Table 3-7, ACCESS link capacity limits](#), on page 3-21.

Note: The Voice Prompt Editor needs one shared channel.

Sharing channels among IVR applications

This is another option where the application to be executed is dependent upon the called number. All 96 IVR channels can be shared amongst Meridian IVR applications.

Outcalling applications

A Meridian IVR application can use the outcalling feature. Depending on the numbers and length of these calls, a number of outcalling channels must be configured. This number is determined in the normal way although the GOS can be lessened depending on the application (a machine is calling now and it can try again if it is blocked). These channels *cannot* be used for incoming calls.

Determining hours of storage

The Meridian IVR prompts and incoming voice messages recorded by Meridian IVR are stored in Meridian Mail mailboxes. Each Meridian Mail mailbox can contain a maximum of six hours of voice storage. All voice prompts used by Meridian IVR and all voice messages recorded by Meridian IVR, must fit into this limit. If the six-hour limit is not sufficient, multiple mailboxes must be assigned.

Estimates must be made to determine the amount of storage (expressed in hours) that all of the prompts for the IVR applications will take prior to creating a storage mailbox for the Meridian IVR system. This can be easily performed by examining the nature of the prompts, (for example, are they short or long), and the quantity of prompts for all of the IVR applications that will exist. Also, determine if voice messages will be created by the IVR application and the amount of storage required to support them. A good starting value for an IVR mailbox is 90 minutes.

Meridian Mail mailboxes are assigned to channels during the initial configuration of Meridian IVR, and multiple channels can use the same mailbox. The exact allocation of mailboxes will be determined by the nature of the applications. In a simple case, one mailbox is used for all Meridian IVR channels, and the prompts for all applications are stored in that single mailbox.

To minimize the storage requirements of the mailboxes, individual applications can be assigned to different groups of channels and each group of channels then use one mailbox. In this case, the full set of application prompts are not stored in each mailbox, rather only the application prompts required by the applications assigned to a group of channels are stored in that one mailbox.

System prompts must exist in every mailbox, regardless of the storage requirements of the mailbox. If more than 24 channels use a single mailbox, there may be a performance degradation when the Meridian Mail system is used. To avoid this situation, a second mailbox should be assigned on a different Meridian Mail node, and the channel allocation should be divided between the two mailboxes.

Notes:

- 1** Since Meridian Mail Release 8 has fully implemented the prompt caching feature, it is unnecessary to create a second mailbox to store duplicate IVR prompts on 24-channel and larger systems.
- 2** While a Meridian Mail system is engineered to provide one to three minutes of storage per user, limits on the maximum amount of storage can and should be set higher for Meridian IVR mailboxes.

Estimating the amount of voice storage

The size of the mailbox is dependent on the number of languages used. An initial value to start off with is 90 minutes of storage for two languages. This would be on top of Meridian Mail requirements if the system was also used for voice mail.

If applications take voice messages, then they must make sure that the messages are removed from the prompt mailbox and delivered to a user mailbox. This would then be considered a voice mail use and must be included in the standard Meridian Mail voice storage determination.

Note: The storage requirement for Meridian IVR system prompts is 50 minutes.

To determine disk size for Meridian Mail

- 1 Determine the number of mailboxes that will be allocated to Meridian IVR.
- 2 Estimate the total hours of storage required for Meridian IVR prompts for each mailbox.
- 3 Add the amount of storage required for transaction messaging for each mailbox.
- 4 If Meridian Mail is used for voice menus or voice processing, this amount must be added to the amount of Meridian Mail storage calculated (see *Site and Installation Planning Guides* (NTP 555-70xx-200)).

Ongoing disk management

Operational Measurement reports allow the system administrator to monitor the disk usage and to forecast when additional storage space will be needed. The actual amount of storage used for IVR mailboxes can be examined by means of Meridian Mail administration. This is also the means by which storage can be increased if required.

Performance tips

- 1 Combine as many prompts together in a PLAY or PDAT cell as the application permits.
- 2 Play prompts from one voice segment file instead of interspersing prompts that will be played together or back to back across multiple voice segment files.
- 3 Dedicated channel acquisition improves IVR performance during call start-up on a per call basis resulting in better performance system wide.

Determining the correct number of ACCESS links

The following table describes the ACCESS link capacity limits for shared and dedicated modes. Use this table to calculate the correct number of ACCESS links for your system.

Table 3-7
ACCESS link capacity limits

For one ACCESS link (in the following mode):	Number of Applications (Channels) at 4,800 bps	Number of Applications (Channels) at 9,600 bps	Number of Applications (Channels) at 19,200 bps (MM10)	Number of Applications (Channels) at 38,400 bps(MM10)
Dedicated mode	18	38	76	96
Shared mode	8	18	38	96

Note: The recommended connection procedure is to connect the ACCESS Link to the Voice Nodes and not to connect more then one ACCESS Link to a Node.

Database servers and host sessions

There can be a maximum of 50 SQL servers, and 64 3270 SNA/5250 and 15 VT100 sessions. The numbers of these are dependent on the access time to the database or host. If the total call time is T seconds and, of that, SQL or host access time is a total of t seconds, then one SQL server or one host session can support T/t channels of that application. However, a safety margin should be applied and each server or host session should support only $T/2t$ channels.

For example, say a 64-channel system is used and each call lasts 100 seconds. Say that total host access time for the whole call is 10 seconds; then each 3270 session can support 5 channels. Thus, 64 channels would need $64/5$ or 13 sessions.

Memory and CPU requirements

Table 3-8
Scenario table for Memory and CPU requirements

Customer will require the following features	Memory required	CPU required
Scenario 1: - 32 IVR Channels - 2 ACCESS Link	32 Mbyte	75 MHz
Scenario 2: - 16 IVR Channels - 4 Fax port - 1 ACCESS Link	32 Mbyte	75 MHz
Scenario 3: - 24 IVR Channels - 2 ACCESS Link - 3270 SDLC, 9 sessions - UPS Option	32 Mbyte	75 MHz
Scenario 4: - 80 IVR Channels - 4 ACCESS Link	48 Mbyte	75 MHz
Scenario 5: - 64 IVR Channels - 4 ACCESS Link - 4 Fax port	48 Mbyte	75 MHz
Scenario 6: - 48 IVR Channels - 4 ACCESS Link - 4 Fax port - 5250 LLC, 18 sessions - UPS Option	48 Mbyte	75 MHz
Scenario 7: - 96 IVR Channels - 6 ACCESS Link - 8 Fax port - 5250 SDLC, 27 Session - UPS Option	64 Mbyte	100 MHz

Table 3-8**Scenario table for Memory and CPU requirements (Continued)**

Customer will require the following features	Memory required	CPU required
Scenario 8: - 96 IVR Channels - 6 ACCESS Link - 8 Fax port - Fully Installed Local Oracle database (Approximation, 10 Mbyte of DRAM usage)	64 Mbyte	100 MHz
Scenario 9: - 96 IVR Channels - 8 ACCESS Link - 8 Fax port - Fully Installed Local Oracle database (Approximation, 10 Mbyte of DRAM usage) - 3270 SDLC, 32 sessions - UPS Options	80 Mbyte	100 MHz

Memory sizing

Memory is an important factor limiting the capacity and feature set of the Meridian IVR 2.0/I system.

This section highlights under what conditions (installing different features) different memory configurations should be determined.

The point system

The “point system” can be used to determine which combination of features and capacity will fit on a particular Meridian IVR 2.0/I system. All calculations are based on total system memory. The value of one “point” is equal to 150 Kbyte.

Caveats:

- 1:** This point system is not intended to accurately predict the free memory for the system, but rather to predict which combinations of features can be installed before exhausting available memory on the system.
- 2:** Values expressed in both **Table 3-9** and **Table 3-10** are derived from measurements on the Meridian IVR 2.0/I system.

Table 3-9
List of Meridian IVR Processes

Process	Points					
	32 Mbyte System	48 Mbyte System	64 Mbyte System	80 Mbyte System	96 Mbyte System	128 Mbyte System
Total permitted Swapping	48	48	48	48	48	48
Total physical memory	218	328	437	546	655	765
Operating System usage	68	68	68	68	68	68
Total Available Points	198	308	465	526	635	745
Combined IVR Memory usage summary						
IVR & Access	96	96	96	96	96	96
Each IVR channel	2	2	2	2	2	2
Each ACCESS Link	4	4	4	4	4	4
Fax Option	25	25	25	25	25	25
Each Fax port	2	2	2	2	2	2
Host Option 3270 & 5250	15	15	15	15	15	15
Host Option VT100	0	0	0	0	0	0

Table 3-9
List of Meridian IVR Processes (Continued)

Process	Points					
	32 Mbyte System	48 Mbyte System	64 Mbyte System	80 Mbyte System	96 Mbyte System	128 Mbyte System
Each Host session (3270, VT100 and 5250) H= 2 If # of sessions <9 H= 4 If # of sessions <18 H= 6 If # of sessions <27 H= 8 If # of sessions <32	H	H	H	H	H	H
UPS Option	12	12	12	12	12	12
SQL (Local or remote) ^a						
Capacity Factor is designated as P. The value of P is dependent on the number of IVR channels. P=7 If channels <12 P=13 If channels <24 P=17 If channels <48 P=20 If channels <64 P=25 If channels <96	P	P	P	P	P	P

a. To find out about your SQL database memory requirements (that is, Oracle, Informix, Sybase and Ingres) please consult the appropriate vendor documentation. You must determine your requirements in Kilobytes, then divide it by 150 (to get the value in points) after that you can use the value in this table to determine your total memory usage.

The following example illustrates how the point system can be used to determine the correct memory size for an Meridian IVR system.

All calculations are based on the following feature set:

- 32 ports of IVR (all shared channels meaning more than one ACCESS link will be required, 9600 baud Link)
- 2 ACCESS Links
- Fax Option with 4 ports
- UPS option

Use **Table 3-9** for determining memory size.

Sample procedure for determining correct memory size

- 1** Add the core software memory usage for IVR and Fax:

$$96 \text{ (IVR)} + 25 \text{ (Fax)} = 121$$

- 2** Add the channel points for IVR and Fax:

$$2 \text{ (per IVR channels)} * 32 \text{ (required channels)} + 4 * 4 \text{ (required fax channels)} = 88$$

- 3** Calculate ACCESS Link points: $4 * 2 \text{ (ACCESS Links)} = 8$

- 4** Check the UPS requirement: 12 points

- 5** Find the Capacity Factor for your system (in our case since we have 32 IVR channels the factor is: 17

- 6** Add all of the above calculated points:

$$121 + 88 + 8 + 12 + 17 = 246$$

- 7** Compare the calculated points with the available points for 32, 64, 96 or 128 Mbyte system memory, in this case we can not use 32 Mbyte system since it does not give us enough memory (Total available memory points is 198) so we have to use next step up memory configuration which is 64 Mbyte of DRAM (417 points).

CPU sizing

This section highlights under which conditions different CPU sizing is recommended.

The same “point system” used for calculating memory requirements can be used to determine which combinations of features and capacity will fit on the Meridian IVR 2.0/I system in terms of CPU load. (See “**The point system**” on page 3-24 for clarification, if needed).

Points are based on total system CPU loading (100 points in total). The point system is not intended to accurately predict the CPU load for the system, but rather to predict which combinations of features can be installed before exhausting available CPU cycles on the system.

All values in the table are derived from measurements on the Meridian IVR 2.0/I system. Calculated values over 100 points (Max 110) indicate that a faster CPU is required.

Table 3-10
CPU point requirements

Total Available Points	Points (CPU Loading Factors)	
	For a 75 MHz System	For a 100 MHz System
IVR (Generations & Access)	25	25
Fax Option	15	25
Each Fax port	4	4
Host Option (Core)	18	18
UPS Option	5	5
SQL (Local and remote)	(25 and 15)	(25 and 15)

Table 3-10
CPU point requirements (Continued)

Total Available Points	Points (CPU Loading Factors)	
	For a 75 MHz System	For a 100 MHz System
Capacity Factor: P= 10 If # of IVR channels <12 P= 13 If # of IVR channels <24 P= 18 If # of IVR channels <48 P= 22 If # of IVR channels <64 P= 30 If # of IVR channels <96	P	P
Total Available Points	100 (Max 110)	122 (Max 134)

The following example illustrates how CPU sizing should be implemented.

All calculations are based on the following feature set:

- 64 ports of IVR (all shared channels meaning three ACCESS link will be required)
- Fax Option with 8 ports
- Host Connectivity (3270 SNA)
- UPS option

Use [Table 3-10](#) for determining CPU size.

Sample procedure for determining correct cpu size

- 1 Add the CPU Loading point requirement for desired feature set:

$$25 \text{ (IVR)} + 15 \text{ (Fax)} + 8 \text{ (fax ports)} * 2 + 18 \text{ (Host Connectivity)} + 5 \text{ UPS} = 79$$

- 2 Find the Capacity Factor for 64 IVR channels: 22
- 3 Add all of the above calculated points: $79 + 22 = 101$

In this case faster CPU is not required since we are not exceeding the CPU Loading point (100 with Tolerance of 10 for 75 MHz CPU).

Disk sizing

The hard disk space required for different Meridian IVR 2.0/I options is documented under “Disk usage” on page 4-10. For additional information regarding third party software disk space requirements (for example, Oracle or Informix) please consult the appropriate manufacturer’s documentation.